EFFICACY AND CHARACTERISTICS OF DOMINICALURE IN FIELD TRAPPING LESSER GRAIN BORERS, RHYZOPERTHA DOMINICA (F.)

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The lesser grain borer, Rhyzopertha dominica (F.) is one of the most abundant and destructive pests of stored rough rice in the Southern USA. It is also a major pest species of rice and other grains throughout the world. An aggregation pheromone for this species has recently been identified (Korramshahi and Burkholder 1981) and synthesized (Williams et al. 1981). There are two components of the pheromone, (S)-(+)-1-methylbutyl(E)-2-methyl-2-pentenoate and (S)-(+)-1-methylbutyl(E)-2,4-dimethyl-2-pentenoate. These components were assigned the trivial names dominicalure 1 (DL-1) and dominicalure 2 (DL-2), respectively.

Traps

Adhesive traps were fabricated from two inverted styrene picnic plates separated by a PVC spacer. The bottom plate was coated with adhesive and the pheromone bait was secured to the spacer with a large binder clip.

Attractancy

The natural ratio of the pheromone components released by the insects is one part of DL-1 to two parts of DL-2. The relative attractiveness of the components and various mixtures was unknown, so a series of tests was designed to test attractiveness under natural conditions. During warm weather, replicated traps were arrayed near a known source of infestation and captured insects were counted each week for five or six weeks. In three different trials spanning two different years we found no statistically significant difference in the components or any mixture thereof. If the traps were baited with pheromone, they caught many insects; if they were not baited, they caught few or none.

Longevity of Pheromone Components

The longevity of pheromone baits is important to trapping programs in terms of maximum efficiency in capturing insects and in terms of economy. Aged components of dominicalure, alone and in combination were tested chemically and were bioassayed with field populations of lesser grain borers.

For the chemical test, 50 microliter dosages of DL-1, DL-2 and mixtures of one part DL-1 to one part DL-2, one part DL-1 to two parts

DL-2 were placed in small embedding capsules and exposed out of doors and in a greenhouse. All capsules were dosed at the same time. Five replicates were immediately placed in a freezer to serve as controls. Then, five replicates of each component and mixture were collected after exposures of 1, 2, 3, 4, 5 and 6 weeks and frozen immediately after collection. When all exposures were complete, each capsule was analyzed by gas chromotography.

The analyses revealed that pure DL-1 is lost faster than pure DL-2. Mixing the components retarded the loss rate for DL-1 but accelerated the rate for DL-2. The pheromone was lost more rapidly from capsules exposed in the greenhouse. Apparently, higher temperatures in the greenhouse accelerated the rate of evaporation of the pheromone.

The longevity of attraction was tested in a field near the Texas A&M Research Center at Beaumont, TX. Adhesive traps were baited with 25 microliter dosages of DL-1, DL-2 and the 1:2 mixture and staked in the field on June 30, 1983. Each of five replicates contained duplicate samples of each component and mixture. Captured insects were counted weekly. One set of baits was replaced each week whereas the other set was never replaced.

This test confirmed the longevity trends suggested by the chemical analyses. Attractiveness of DL-1 began to decline during the third week and continued to decline thereafter. DL-2 and the 1:2 mixture caught similar numbers of insects until the eighth week, after which, fresh baits began to catch significantly more insects than aged baits. Even so, aged baits caught many more insects than controls.

The pheromone was also tested in practical situations, near farm storages, commercial rice fields, pastureland and forests. In all cases, the baits were of the 1:2 mixture and were refreshed every other week. Populations of lesser grain borers were detected in all environments sampled. However, insect populations were not equivalent in locations that were apparently similar. For example there was a wide deviation among 12 different farm storages. This was not attributable to different control procedures applied by the farmers. All used essentially the same control measures. In outdoor environments, some farms harbored large populations of lesser grain borers and some did not. Again, the difference could not be attributed to variation in control measures. The farms were widely separated but there was no obvious difference in the flora and fauna (other than lesser grain borers) of any of them. Thus, the relationship of the lesser grain borer to the various environments in which it lives is incompletely known.

References

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